What do we know about hybridizing cattail species and their impacts on invaded ecosystems?

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http://www.fs.fed.us/r9/forests/white_mountain/ecosystems/WMEDN/nnis_plants/nnis_forest.htm

Wetlands are hotspots for biogeochemical cycling

- Plant invasions may interfere with some of the vital functions wetlands perform
  - Alter composition of **microbial communities** that carry out those functions
- Nutrient pools and cycling
  - Denitrification

This project

- Broadly, it addressed whether invasive species affected microbially-mediated nutrient pools and transformations
  - *Typha* spp. as a model system

- Specifically, it asked
  - Whether cattail species affected nutrient pools, denitrification, and denitrifier communities differently
  - Whether time since invasion was correlated with some of these effects in areas invaded by *Typha x glauca*

Typha as a model system

- ***Typha latifolia*** = native
- ***Typha angustifolia*** = believed to be invasive from Europe… debatable (but behaves like one)
- ***Typha x glauca*** = invasive


x

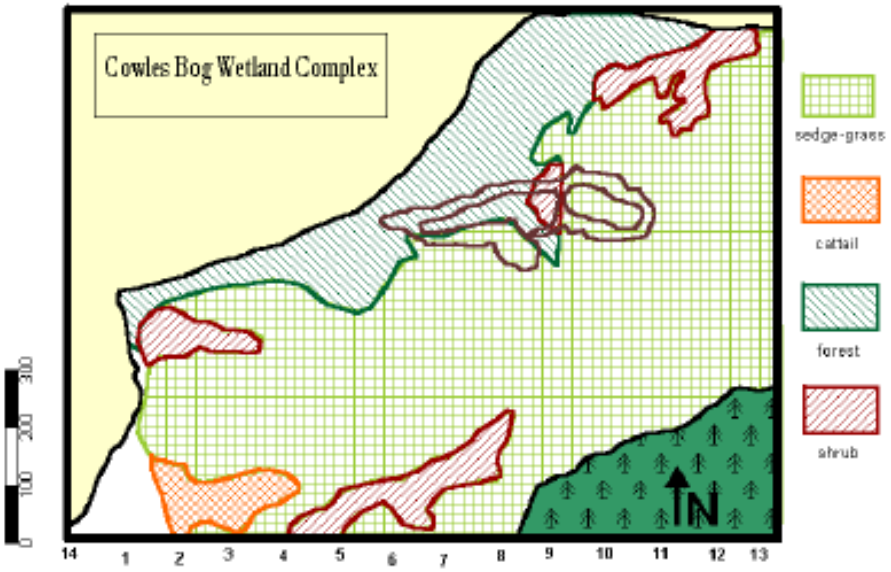
=


Hypotheses

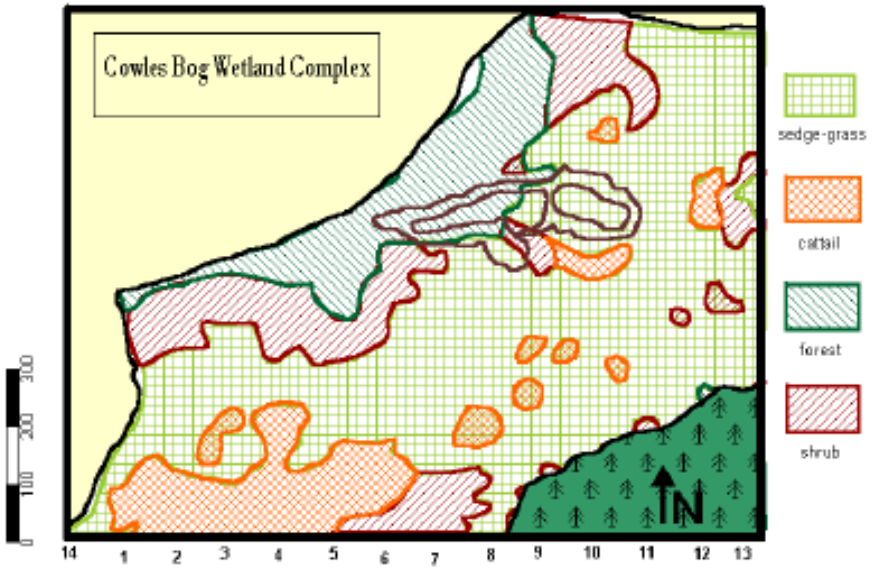
- Sites invaded by cattail species will be different than those associated with native cattail or native plants
  - Nutrient pools (SOM, NO_3, NH_4)
  - Denitrification
  - Denitrifier (microbial) communities

- Sites invaded by *T. x glauca* for different amounts of time will show differences in above attributes

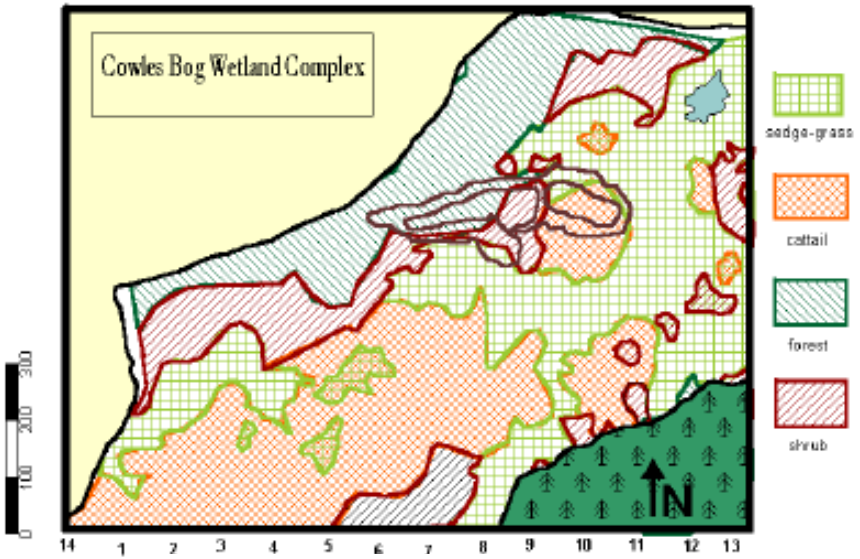
Vegetation map: Dan Mason, NPS 2004



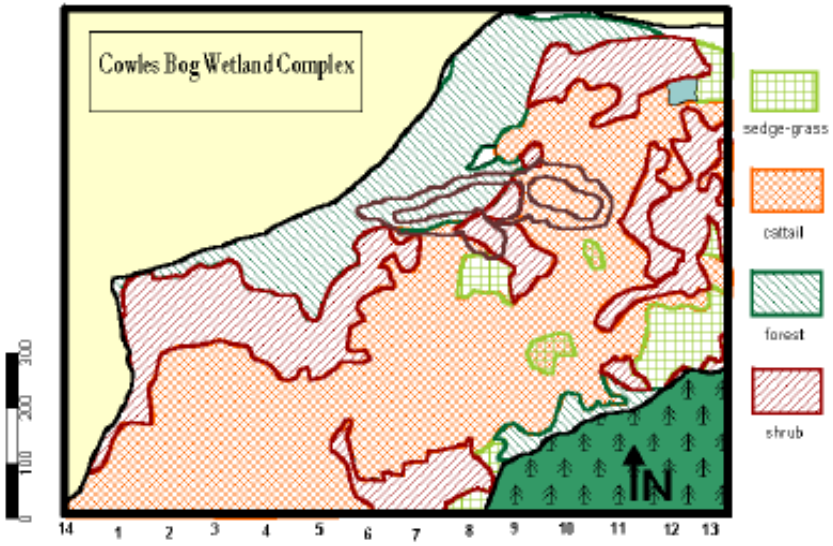
1938



1970



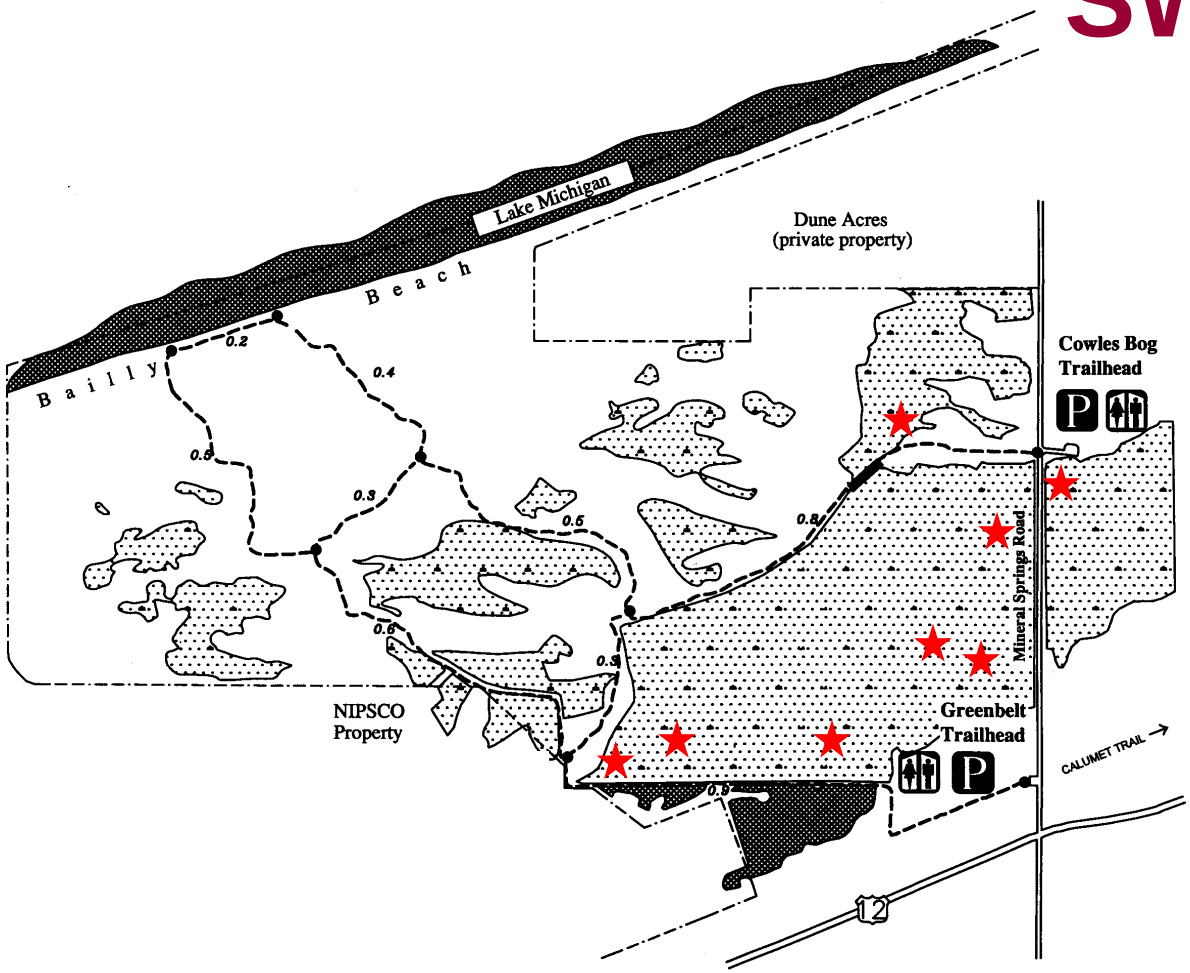
1973



1983

Geographic location of sites roughly corresponded with invasion history

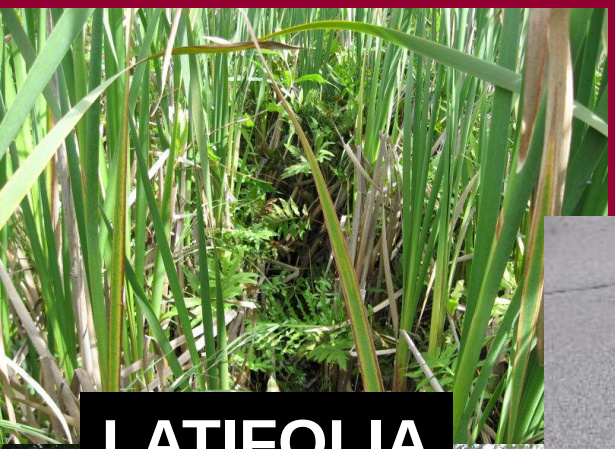
SW → NE



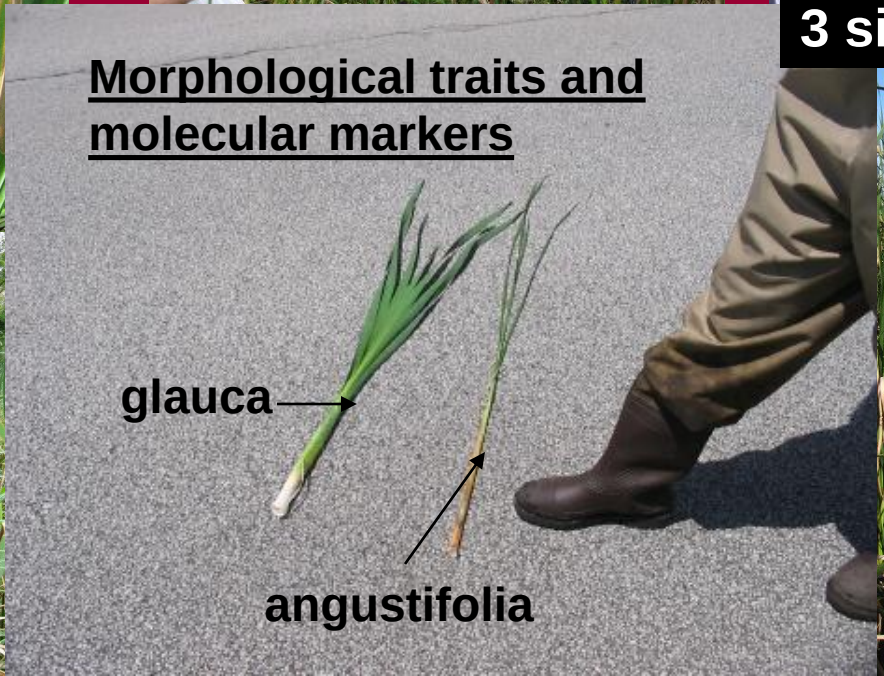

NATIVE

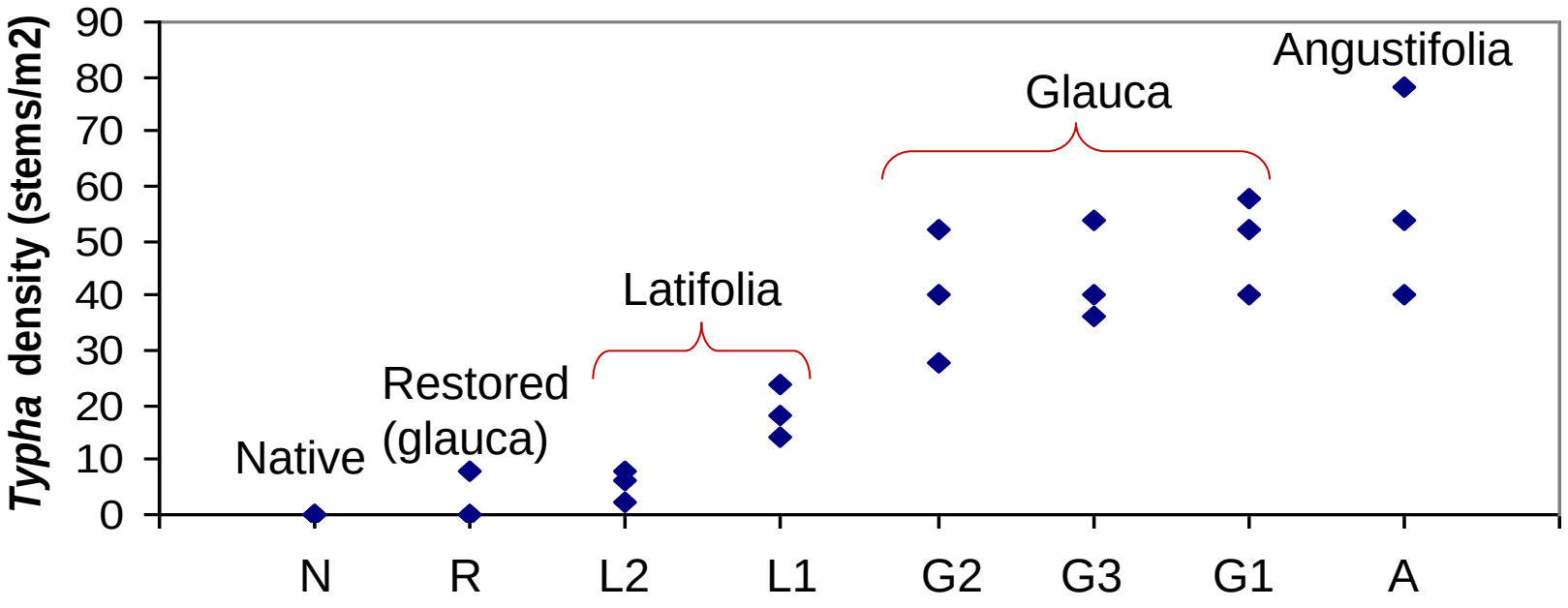

ANGUSTIFOLIA

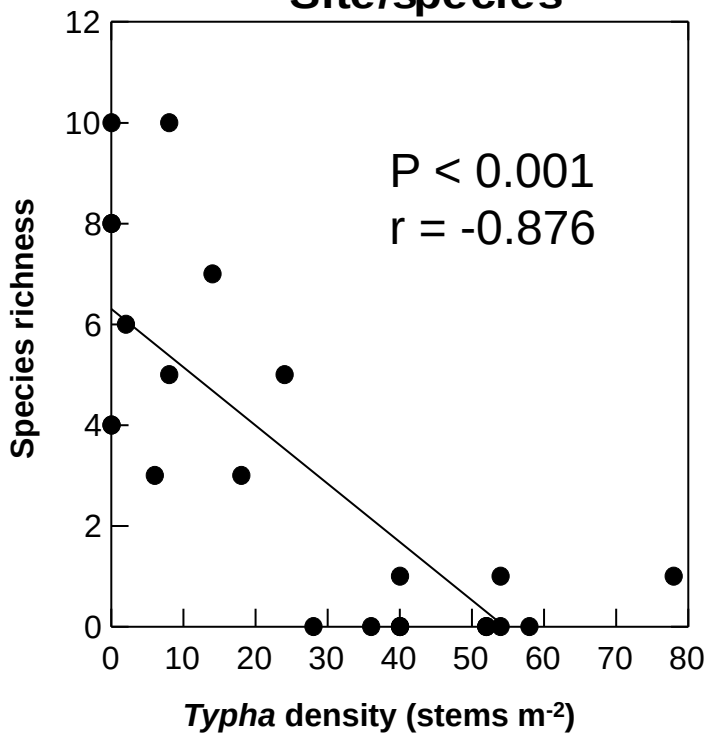

GLAUCA
3 sites differing in age

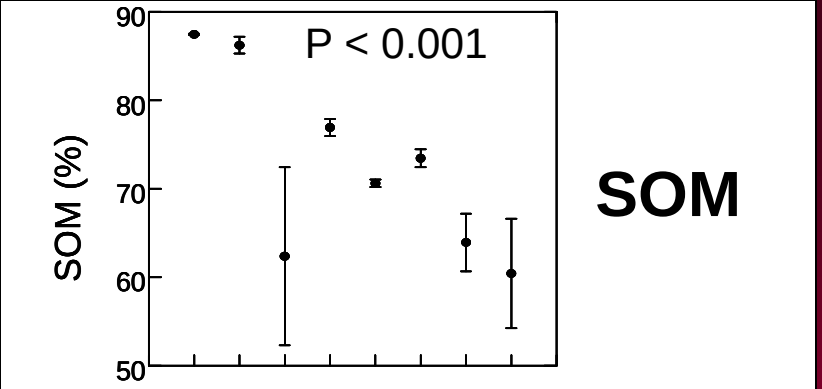



LATIFOLIA
2 sites

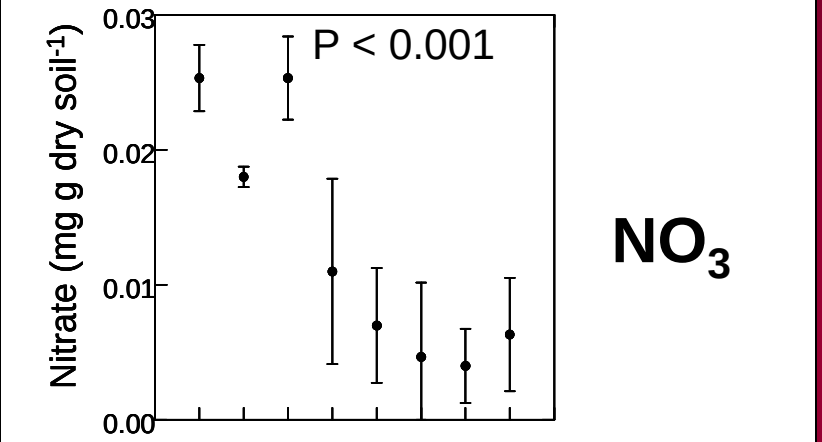

Morphological traits and
molecular markers
glauca
angustifolia


Typha density (stems/m2)
90
80
70
60
50
40
30
20
10
0
Native
Restored (glauca)
Latifolia
Glauca
Angustifolia
N
R
L2
L1
G2
G3
G1
A
Site/species

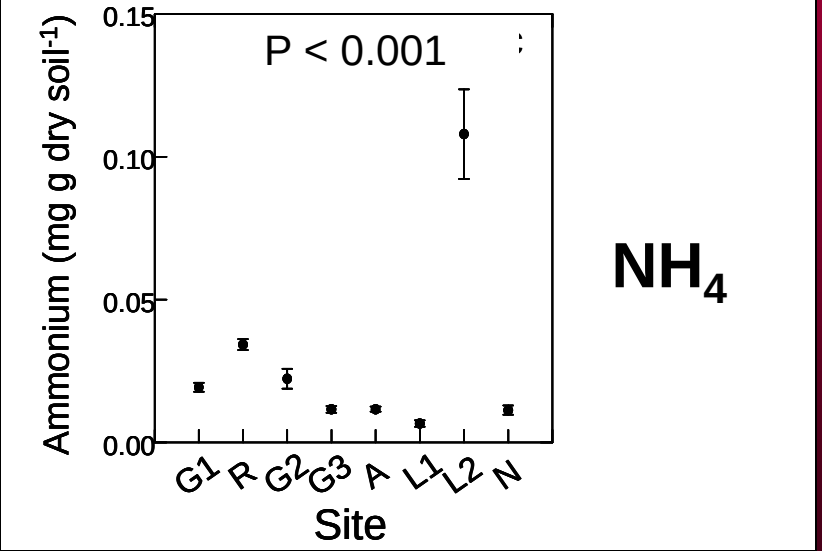

P < 0.001
r = -0.876
Species richness
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
Typha density (stems m-2)



SOM



NO_3



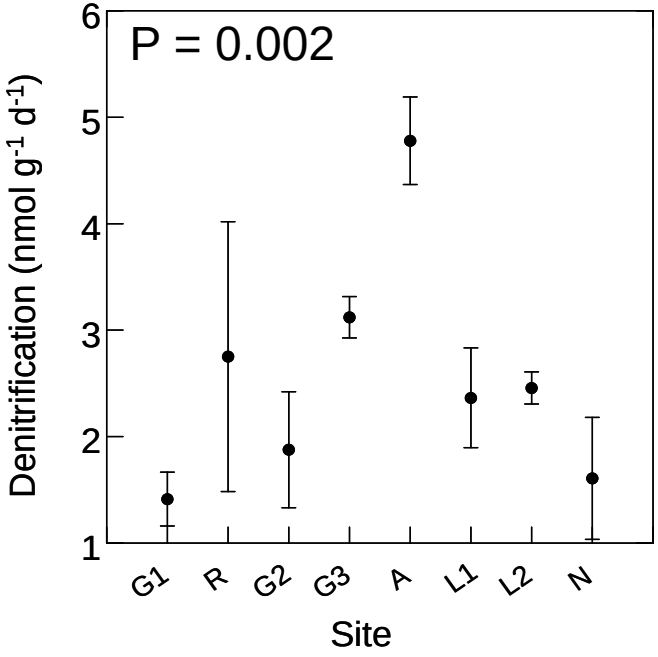
NH_4

Are nutrient pools and DN different?

40 yrs 20 yrs 13 yrs

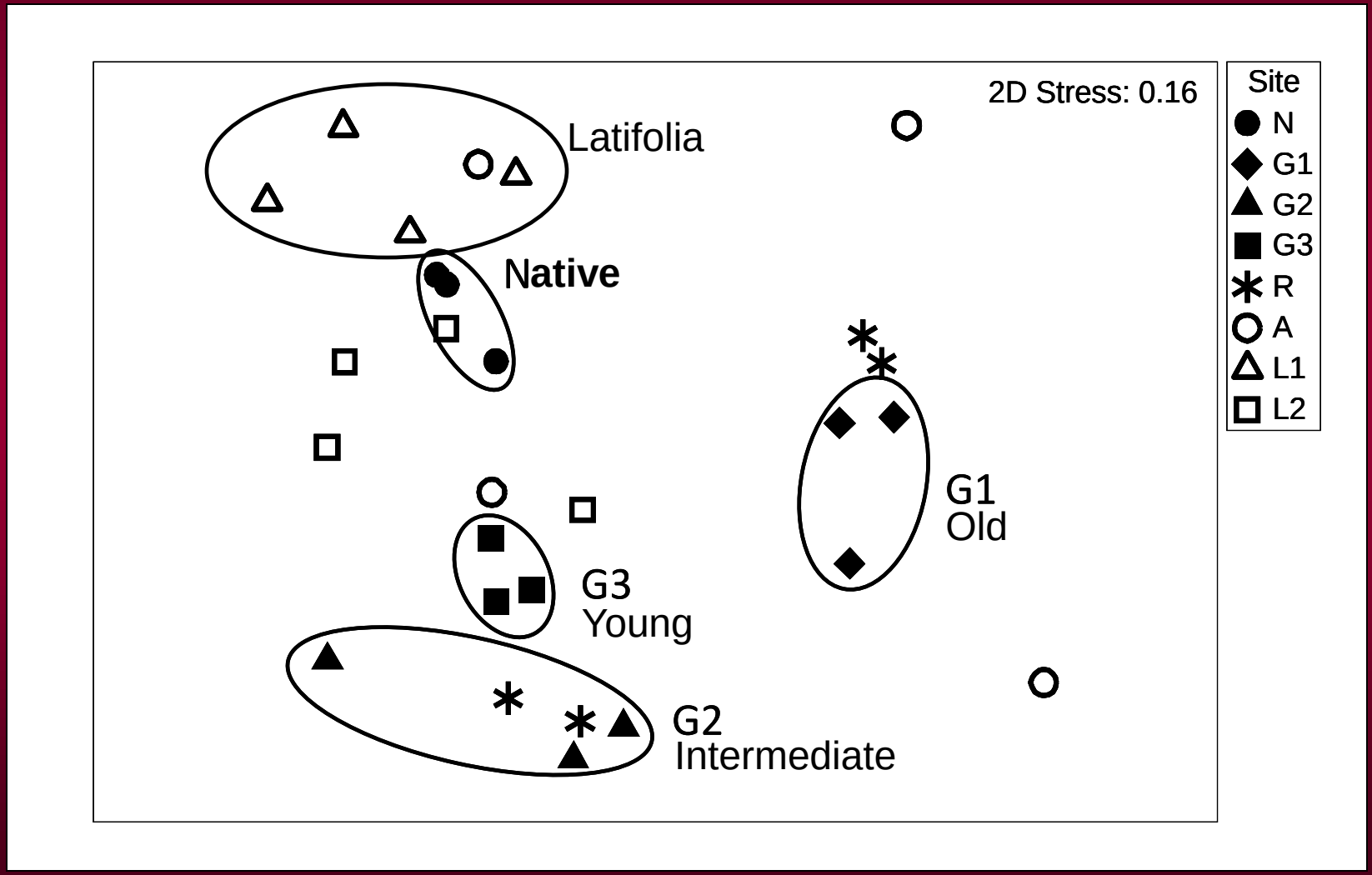
G1 R G2 G3 A L1 L2 N

Invasion history (older to younger)

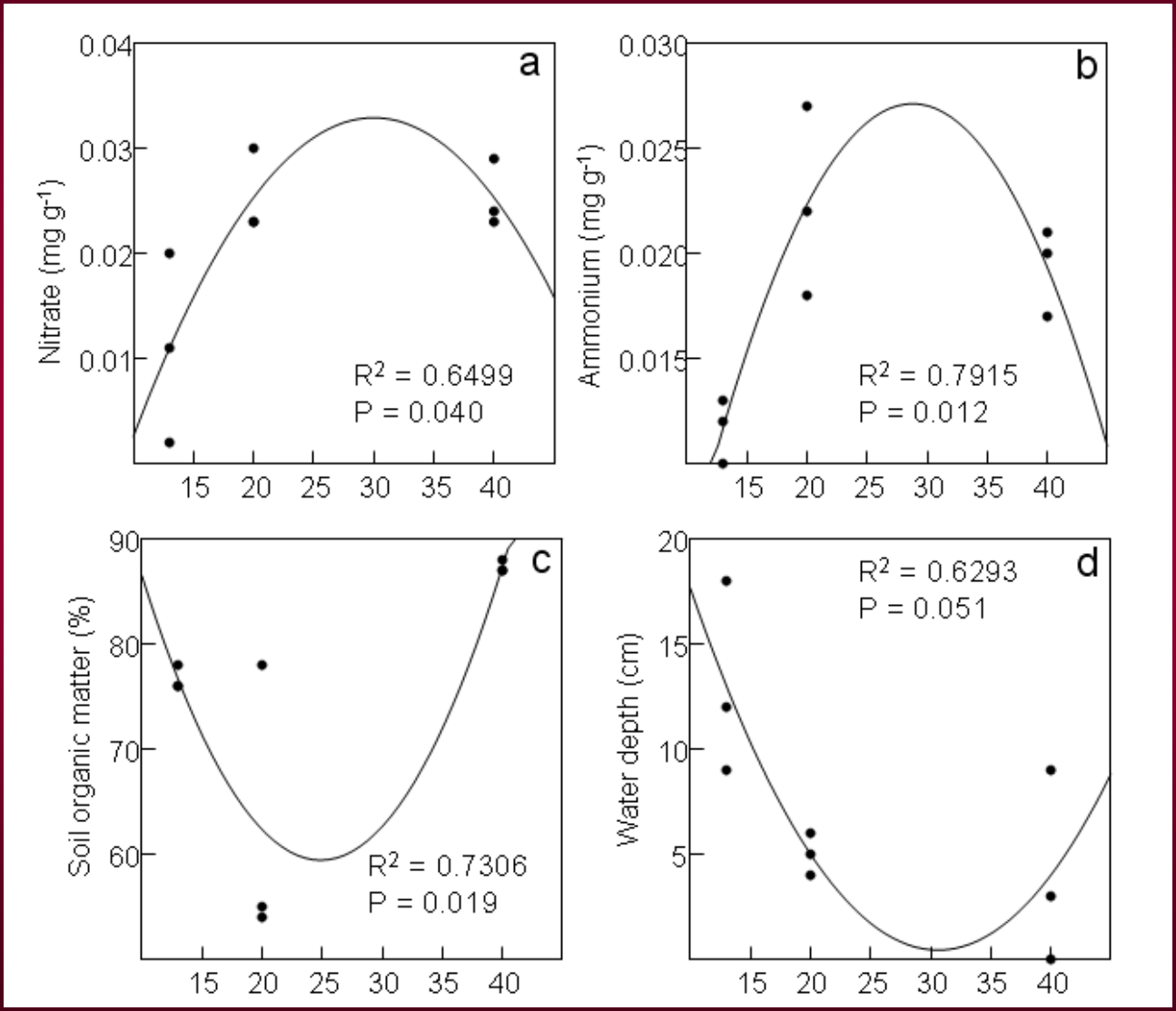


DN

Are denitrifier communities different? (based on *nirS* gene)



Does time since invasion correlate with *Typha x glauca* effects?



Conclusions

- Not all *Typha* are equal
  - Underscores the need for proper identification
- *Typha* species differed in nutrient pools, denitrification, and denitrifier communities
- History of invasion may determine "soil legacies"
  - NO_3 and NH_4 → non-linear, hump-shaped trend
  - SOM and H_2O level → non-linear, U-shaped trend

Thanks

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